

Angiosperms, Hydrophytes of five ephemeral lakes of Thiruvallur District, Tamil Nadu, India

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ABSTRACT: The aim of this study was to document the Angiosperm diversity of five ephemeral lakes of Thiruvallur District of Tamil Nadu South India. Qualitative floristic surveys were carried out during 2005-2007. Herbarium specimens with voucher number, taxonomical and ecological information were deposited to the herbarium, Pachaiyappa's College (PCH) Chennai, Tamilnadu. Forty five species of hydrophytes belonging to 21 families and 34 genera were documented. Most speciose families were Poaceae with 5 species followed by Polygalaceae and Nymphaeaceae (4) Cyperaceae, Hydrocharitaceae, Najadaceae, and Scrophulariaceae (3 species each). Mean depth of all five lakes shrinking gradually due to severe anthropogenic pressure. Conservation of wetlands is the need of the hour to protect the biota as well as quality of drinking water.

INTRODUCTION

Lakes are complex ecosystems composed of distinct habitats influenced by biological, physical and chemical processes. Aquatic macrophytes are larger plants which actively grow continuously or periodically depending upon the availability of required amount of water. They occur submerged below or floating on the surface or growing up through the water surface. These plants play an important role in the structure and function of the aquatic ecosystem. Threats to fresh waters such as pollution of different kinds, unfavourable climatic changes, eutrophication, acidification, and alien species invasion lead to reduction in native macrophytic diversity which also threatens the faunal diversity of aquatic ecosystem. (Chambers *et al.* 2008). The fresh water ecosystems in Asia are no exceptions and they are also exposed to these serious threats. Conservation of freshwater biodiversity faces serious challenges because of lack of public awareness about its magnitude and importance (Dudgeon 2000). Studies on aquatic flora of India are in its juvenile phase. Earlier, Subrahmanyam (1962) has described 117 aquatic angiosperms. Lavania *et al.* (1990) has compiled the wetland flora of India; Cook (1996) has published the aquatic and wetland flora of India. From plant biodiversity point of view, many of the perennial and ephemeral lakes of Tamil Nadu still remain unexplored. In this paper, for the first time we present a checklist of aquatic angiosperms of five ephemeral lakes of Thiruvallur District of Tamil Nadu state, India.

MATERIALS AND METHODS

Study site

Five ephemeral lakes chosen for preparing a checklist of aquatic angiosperms occur in the interior of the Thiruvallur District, Tamil Nadu state: Nadukutthagai (NK) (13°12'88" N, 80°04'32" E), Nimilacherry (NC)

(13°12'73" N, 80°05'15" E), Palavedu (PV) (13°14'23" N, 80°04'60" E), Thandurai (TD) (13°13'14" N, 80°02'26" E) and Thirunindravur (TR) (13°11'55" N, 80°05'49" E) (Figure 1).

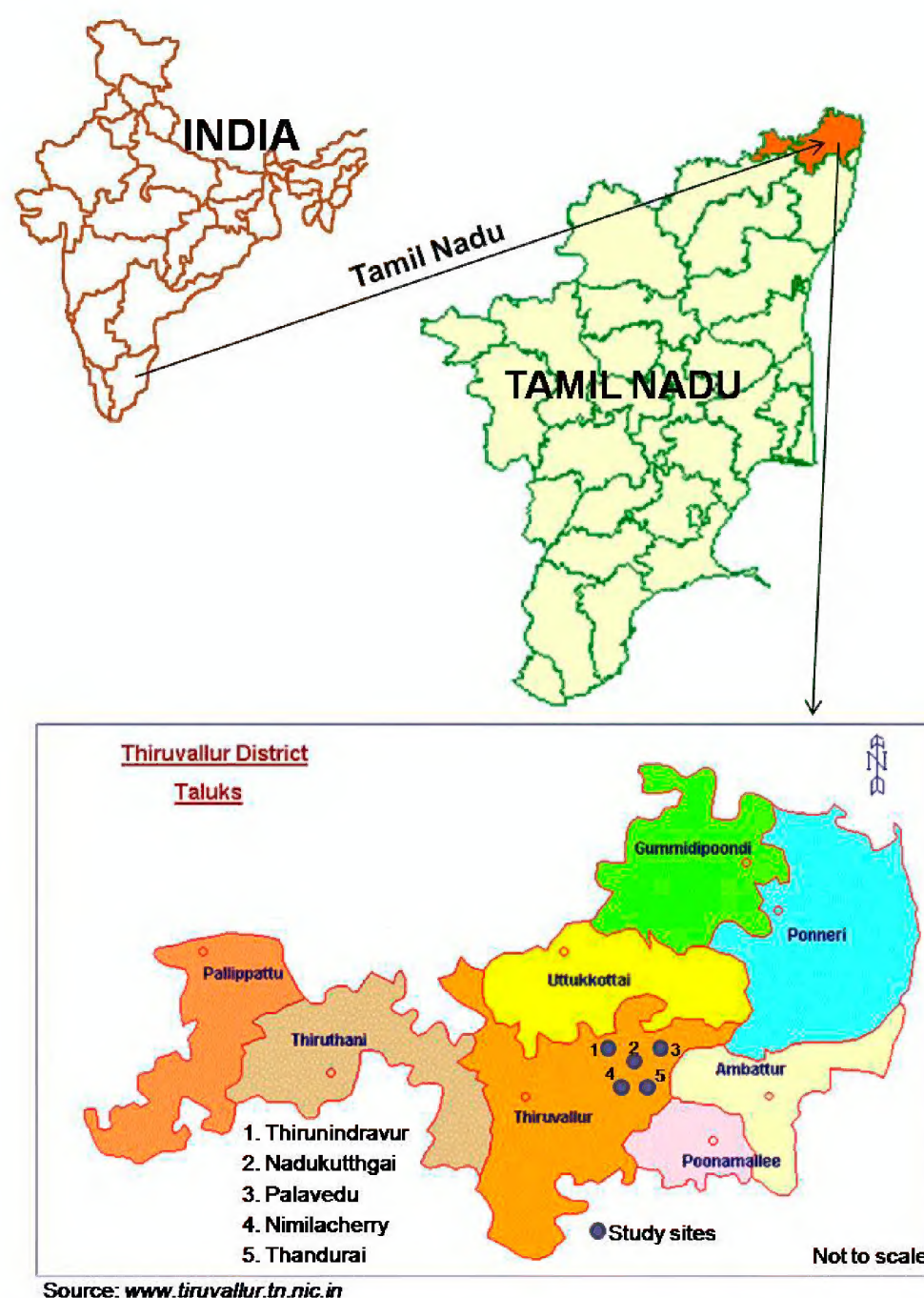


FIGURE 1. Map showing the study sites, wherein aquatic angiosperms were documented during 2005-2007 at Thiruvallur District, Tamil Nadu, India.



FIGURE 2. Part of the lake Palavedu (PV) in early days of water filling period at Thiruvallur District, Tamil Nadu, India.

Mean depth of lakes varied across the sites 185, 170, 257, 234 and 248 cm in NK, NC, PV, TD and TR respectively. Filling up of water in the lakes is taking place during the month of October-November (Figure 2). Inundation period of lakes is about eight months (October-June) and they remain dry for four months (July-September) in a year. Thiruvallur, a coastal district (12°10' and 13°15' N, 79°15' and 80°20' E) has an area of 3424 km², with Bay of Bengal and Chennai on the east, state of Andhra Pradesh (north), Kanchipuram district (south) and Vellore district on the west.

The mean maximum and minimum temperature is 33 °C and 24 °C respectively. The relative average humidity is 76.8 %. The average annual rainfall is around 1108 mm, nearly two thirds of the annual rainfall is received during the north east monsoon (October-December). As on, 2001 survey the human population is 2.75 million (Tamil Nadu Government website).

Data collection

Qualitative floristic survey was carried out during 2005-07 in about 55 man days. All the angiosperm hydrophytes were identified using regional floras (Gamble 1921; Gamble 1928; Gamble and Fischer 1935; Matthew 1991; Nair and Henry 1983; Henry *et al.* 1987; Henry *et al.* 1989). Bentham and Hooker's Natural system of classification was followed to classify the species. Author citation and binomial of collected species were verified with International Plant Names Index (IPNI). Preserved herbarium specimens with voucher number were deposited with Pachaiyappa's College Herbarium (PCH) with taxonomical and ecological information such as floating, submerged anchored, floating leaved anchored and emergent anchored (Daubenmire 1947).

RESULTS AND DISCUSSION

A total of 45 species in 34 genera and 22 families were recorded. This qualitative floristic survey conducted for the first time in this part of the country showed the wealth of aquatic angiosperm flora of five ephemeral lakes. Maximum of 36 species were recorded from Palavedu lake followed by Nimilacherry (28), Nadukutthagai (27),

Thirunindravur (21) and Thandurai (18 species). Families with maximum number of species include Poaceae with five species followed by Polygalaceae and Nymphaeaceae (four). Cyperaceae, Hydrocharitaceae, Najadaceae, and Scrophulariaceae were represented by three species each. Acanthaceae, Alismataceae, Amaranthaceae, Aponogetonaceae, Gentianaceae, Mimosaceae, Polygonaceae and Typhaceae were represented by only one species (Table 1). Few important plant species are featured in Figures 3-8.

Among five morpho-ecologic groups, emergent anchored with 23 species dominated the lakes followed by floating (eight), floating leaved anchored and submerged anchored (six each), and submerged with two species. Presence of *Ipomoea carnea*, *Pistia stratiotes*, *Eichornia crassipes* indicated a clear sign of invasion of alien species in these lakes (Figures 9 and 10). Quantitative and qualitative floristic survey, constant monitoring and protection of lentic and lotic ecosystems are the need of the hour in order to save the native biota, to maintain the quality of drinking water, and disqualify the efforts of alien species to invade.



FIGURE 3. *Alternanthera sessilis* grows luxuriantly on shores of the lakes.



FIGURE 4. *Aponogeton natans*, an edible tuber yielding hydrophyte establishing life on low-depth areas.

TABLE 1. List of hydrophytes, encountered during 2005-2007 from five ephemeral lakes Nadukutthagai (NK), Nimilacherry (NC), Palavedu (PV), Thandurai (TD) and Thirunindravur (TR) of Thiruvallur District, Tamil Nadu, India. *Pachaiyappa's College Herbarium.

No. FAMILY AND BINOMIAL	MORPHO-ECOLOGIC GROUP	LAKE	PCH no.*
ACANTHACEAE			
1. <i>Hygrophila schulli</i> M.R.Almeida & S.M. Almeida	Emergent anchored	NC, PV	570
ALISMATACEAE			
2. <i>Limnophyton obtusifolium</i> Miq.	Emergent anchored	PV	580
AMARANTHACEAE			
3. <i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	Floating	NK, NC, PV, TD, TR	569
APONOGETONACEAE			
4. <i>Aponogeton natans</i> (L.) Engl. & K. Krause	Floating leaved anchored	NK, NC, PV	572
ARACEAE			
5. <i>Monochoria vaginalis</i> C. Presl	Floating	NK, NC, PV	591
6. <i>Pistia stratiotes</i> L.	Floating	NK, NC, PV, TD, TR	571
CERATOPHYLLACEAE			
7. <i>Ceratophyllum demersum</i> L.	Floating	PV, TR	592
CONVOLVULACEAE			
8. <i>Ipomoea aquatica</i> Forssk.	Floating leaved anchored	NK, NC, PV, TD, TR	614
9. <i>Ipomoea carnea</i> Jacq.	Emergent anchored	NK, NC, PV, TD, TR	613
CYPERACEAE			
10. <i>Cyperus rotundus</i> L.	Emergent anchored	NK, NC, PV, TD, TR	612
11. <i>Kyllinga bulbosa</i> P. Beauv.	Emergent anchored	NC, PV	611
12. <i>Scirpus articulatus</i> L.	Emergent anchored	NK, NC, PV	581
GENTIANACEAE			
13. <i>Enicostemma axillare</i> (Lam.) A.Raynal	Emergent anchored	PV	610
HYDROCHARITACEAE			
14. <i>Hydrilla verticillata</i> (L. f.) Royle	Submerged anchored	NK, NC, PV, TD, TR	609
15. <i>Ottelia alismoides</i> (L.) Pers.	Submerged anchored	NK, NC, PV	582
16. <i>Vallisneria natans</i> (Lour.) H.Hara	Submerged anchored	PV	593
LEMNACEAE			
17. <i>Lemna gibba</i> L.	Floating	NK, NC, PV, TD, TR	594
18. <i>Wolffia globosa</i> Roxb.	Floating	NC, PV	573
LENTIBULARIACEAE			
19. <i>Utricularia caerulea</i> L.	Submerged	PV	600
20. <i>Utricularia polygaloides</i> Edgew.	Submerged	PV	579
MIMOSACEAE			
21. <i>Neptunia prostrata</i> Baill.	Floating	PV	608
NAJADACEAE			
22. <i>Najas graminea</i> Delile	Submerged anchored	NK, NC, PV, TD, TR	590
23. <i>Najas indica</i> (Willd.) Cham.	Submerged anchored	NK, NC, PV, TD, TR	595
24. <i>Najas minor</i> All.	Submerged anchored	NK, NC, PV, TD, TR	583
NYMPHAEACEAE			
25. <i>Nelumbo nucifera</i> Gaertn.	Floating leaved anchored	NK, NC, PV, TD, TR	574
26. <i>Nymphaea nouchali</i> Burm.f.	Floating leaved anchored	PV	607
27. <i>Nymphaea pubescens</i> Willd.	Floating leaved anchored	NK, NC, PV, TD, TR	589
28. <i>Nymphaea rubra</i> Roxb. ex Salisb.	Floating leaved anchored	PV	596
ONAGRACEAE			
29. <i>Ludwigia adscendens</i> (L.) H. Hara	Emergent anchored	NK, NC, PV, TD, TR	575
30. <i>Ludwigia perennis</i> L.	Emergent anchored	PV	606
POACEAE			
31. <i>Chloris barbata</i> Sw.	Emergent anchored	NK, NC, PV, TD, TR	588
32. <i>Cynodon dactylon</i> (L.) Pers.	Emergent anchored	NK, NC, PV	605
33. <i>Dactyloctenium aegyptium</i> (L.) Willd.	Emergent anchored	PV	604
34. <i>Echinochloa colona</i> (L.) Link	Emergent anchored	NK, NC, PV, TD, TR	576
35. <i>Sporobolus coromandelianus</i> (Retz.) Kunth	Emergent anchored	NK, NC, PV	603
POLYGALACEAE			
36. <i>Polygala arvensis</i> Willd.	Emergent anchored	NK, NC, TD, TR	585
37. <i>Polygala chinensis</i> L.	Emergent anchored	NK, NC, TD, TR	602
38. <i>Polygala erioptera</i> DC.	Emergent anchored	NK, NC, TD, TR	597
39. <i>Polygala javana</i> DC.	Emergent anchored	PV	577
POLYGONACEAE			
40. <i>Polygonum glabrum</i> Willd.	Emergent anchored	NK, NC, TR	598
PONTEDERIACEAE			
41. <i>Eichornia crassipes</i> (Mart.) Solms	Floating	NK, NC	578
SCROPHULARIACEAE			
42. <i>Limnophila aromatica</i> (Lam.) Merr.	Emergent anchored	NK, NC	586
43. <i>Limnophila heterophylla</i> Benth.	Emergent anchored	TR	599
44. <i>Striga angustifolia</i> (D.Don) Saldanha	Emergent anchored	NK	601
TYPHACEAE			
45. <i>Typha angustifolia</i> L.	Emergent anchored	NK	587



FIGURE 5. *Aponogeton natans* in flowering.



FIGURE 6. *Lemna gibba* a small, pioneer colonizer of fresh water ecosystem, associated to the tiny *Wolffia globosa*.

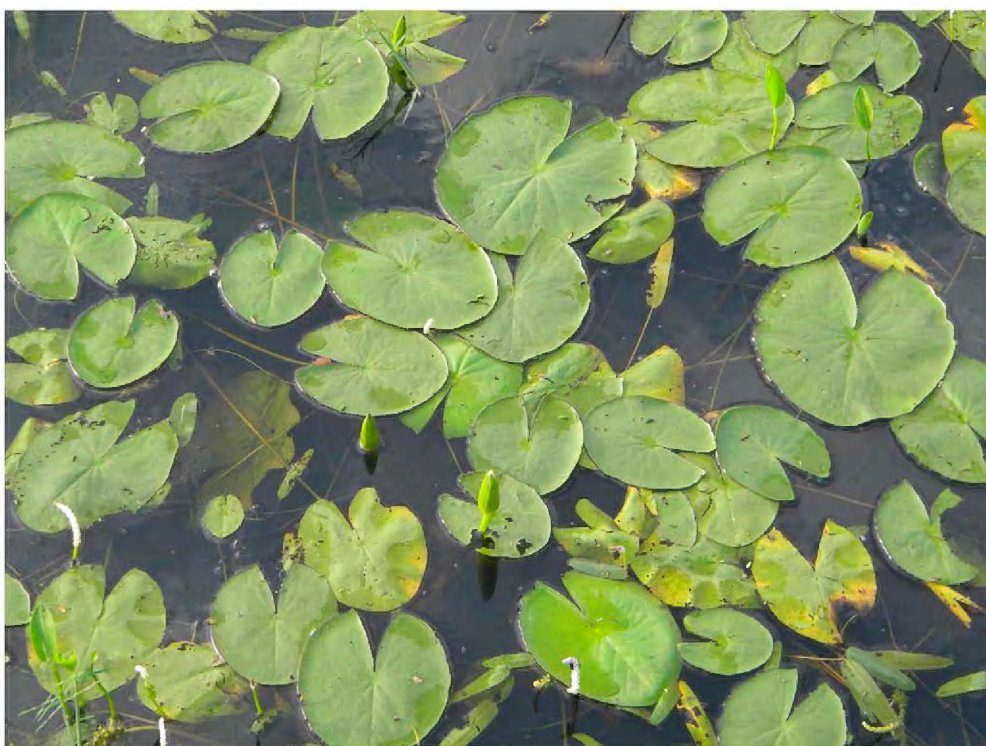


FIGURE 7. *Nymphaea nouchali* a sacred plant, yields edible nut-lets.



FIGURE 8. *Polygonum glabrum* grows throughout the year in and around the lake.



FIGURE 9. *Ipomoea carnea* an alien invasive weed.



FIGURE 10. *Pistia stratiotes* an alien invasive, aggressive weed.

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